September 23, 2016

Office of Engineering and Technology
Federal Communications Commission
Washington, D.C., United States

Re: ET Docket No. 13–49, FCC 16–68

Dear Sirs,

EFFECTIVE DSRC RANGE CALCULATION

The Commission received multiple submissions addressing Dedicated Short Range Communications (DSRC) spectrum sharing. Many arguments were made. But none of the submissions have actually shown the expected communication performance.

The following discussion refers to the debated lower 40MHz DSRC channel.

The "detect-and-avoid" scheme is using four 10MHz channels. Assuming SAE J2945/1 receive sensitivity goal, a packet will be received when its energy is higher than -92dBm. DSRC detection mechanism would be triggered when preamble is detected above -85dBm for each 10MHz channel. Until DSRC unit is detected, WIFI station would transmit. After detection, DSRC operation would be assured, as the WIFI station should cease transmission temporarily.

The "re-channelization" scheme is dividing the band to two 20MHz channels. Assuming same quality of receiver, a packet will be received when its energy is higher than -89dBm. Common IEEE802.11ac secondary channel detection will detect preamble with energy higher than -72dBm. WIFI doesn't vacate the channel, and the DSRC competes on channel access without any preference at the PHY level. A busy WIFI station would override the DSRC completely if received energy is lower than -72dBm, and allow non-exclusive channel access, when received energy is higher. The effective range is shortened to the -72dBm receive energy, and even within that range, DSRC operation isn't assured, and can't be used for life-critical functions.

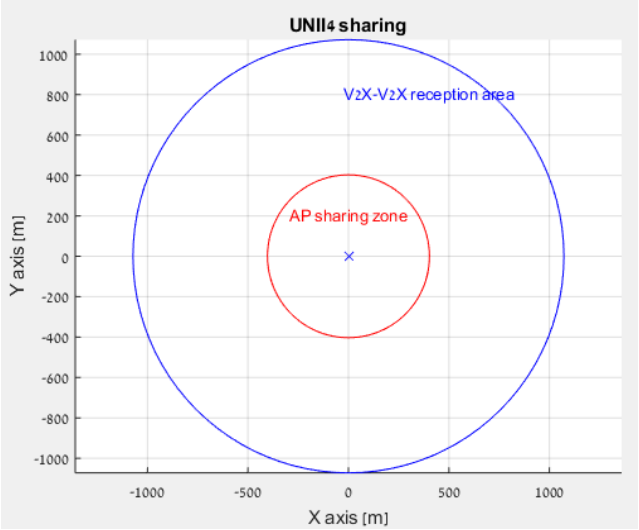
	Receive sensitivity	**DSRC detection threshold**	**DSRC sharing post detection**
Detect-and-avoid	-92dBm	-85dBm	Assured operation for all packets
Re-channelization	-89dBm	-72dBm	Non-assured operation for >-72dBm

Table 1 – Summary of effective range for each scheme

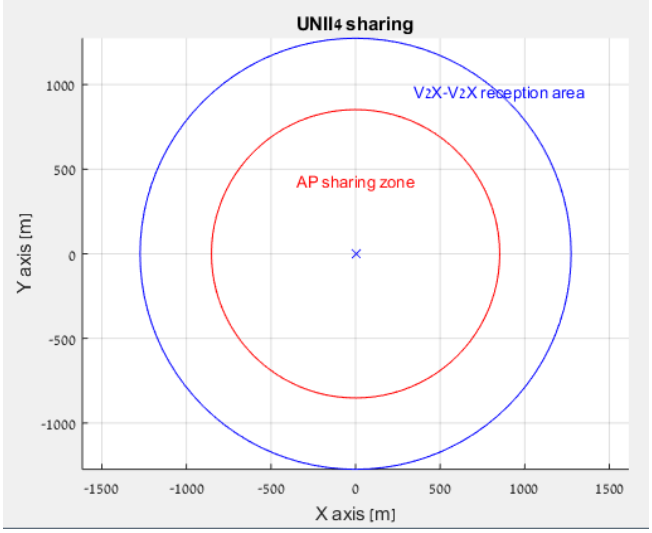
Range is calculated for two propagation models:

- **Two-ray model**: communication between two vehicles in direct view without any obstructing elements in-between. Two-ray model provides the upper bound for range.
- **Urban obstructed line-of-sight (OLOS) model**: communication between two vehicles in deeply-urban environment, subject to some obstructions. The model is taken from the paper: "A Measurement Based Shadow Fading Model for Vehicle-to-Vehicle Network Simulations" by Abbas, Sjoberg, Karedal and Tufvesson.

Two-ray model:

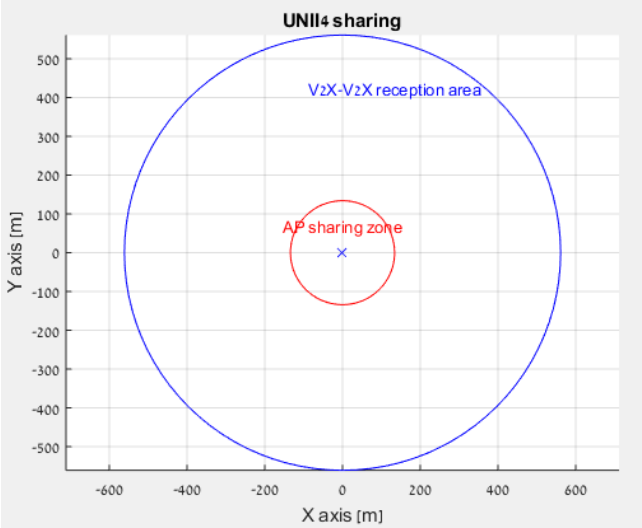


Re-channelization (DSRC reception not assured inside red circle)

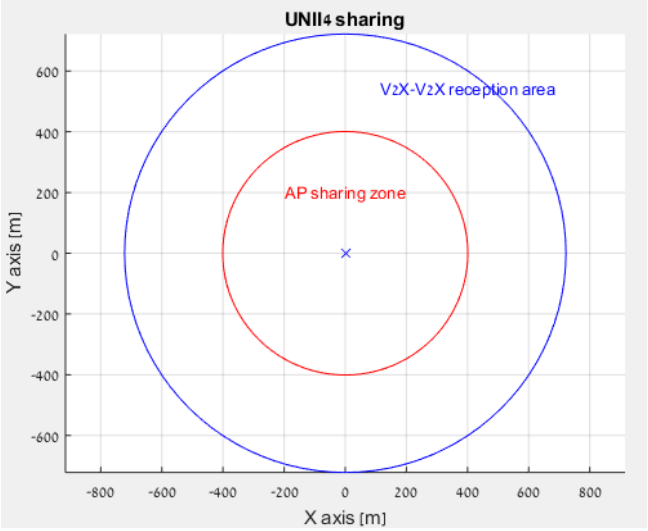


Detect-and-avoid (DSRC detection zone inside red circle)

Urban OLOS model:



Re-channelization (DSRC reception not assured inside red circle)



Detect-and-avoid (DSRC detection zone inside red circle)

The graphs speak for themselves. The effective range provided by re-channelization scheme is less than half the detection range of detect-and-avoid scheme. The usage of DSRC along WIFI with by re-channelization scheme would be uncertain and unsafe.

Please feel free to contact me for additional information.

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